Distributed Embedded Fiber Optic Sensor (EFISense) SHM System, Phase I
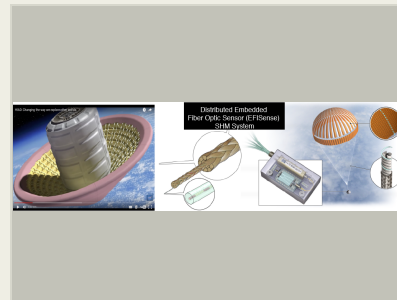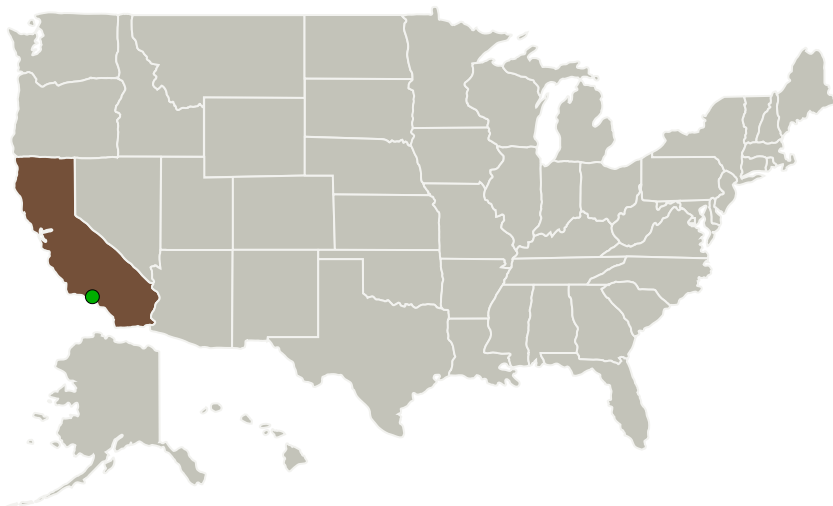
Completed Technology Project (2016 - 2016)

Project Introduction

In Phase I, Redondo Optics Inc. proposes to develop, demonstrate, and deliver to NASA a unique fully integrated, miniature, lightweight, self-powered, wireless communication embedded optical fiber sensor (EFISense) SHM system suitable for the time-synchronized distributed monitoring of passive and dynamic loads/stress/strains within the strands, rope, and fabric of large and entire cross-sections of NASA's trailing body deployable decelerator systems such as parachutes and ballutes to provide immediate information to the crew of any detected fault or structural damage within the decelerator representing a valuable safety early warning protection for the crew and space vehicles. The EFISense system is based on the strategic integration of key technologies including the use of distributed array of embedded fiber Bragg gratings sensor weaved within the strands, yarn, and/or fabric of parachutes or ballutes decelerators, and the use of ROI's proprietary WDM/TDM photonic integrated circuit (PIC) microchip technology that enables the production of a lightweight, compact, and self-power (battery) operation of a multiplex EFISense transceiver sensor interrogation system. In Phase II, the EFISense SHM system will be engineered into a stand-alone autonomous system and integrated into an airborne ready decelerator prototype system and tested under load environments representative of decelerator decent missions. When developed, the miniature self-power EFISense SHM system will provide a new and innovative global coverage SHM solution for NASA's trailing body decelerator technologies as well as other spacecraft systems where size, weight, and power are critical for operation.

Primary U.S. Work Locations and Key Partners

Distributed Embedded Fiber Optic Sensor (EFISense) SHM System, Phase I

Table of Contents

For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/90143

Distributed Embedded Fiber Optic Sensor (EFISense) SHM System, Phase I

Completed Technology Project (2016 - 2016)

| Organizations Performing Work	Role	Type	Location
Redondo Optics, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Redondo Beach, California
🟢Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

▶ **June 2016:** Project Start

✅ **December 2016:** Closed out

Closeout Documentation:
- Final Summary Chart*(https://techport.nasa.gov/file/139727)*
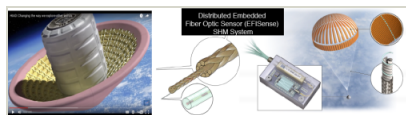
Images

Briefing Chart Image
Distributed Embedded Fiber Optic Sensor (EFISense) SHM System, Phase I
(https://techport.nasa.gov/image/126743)
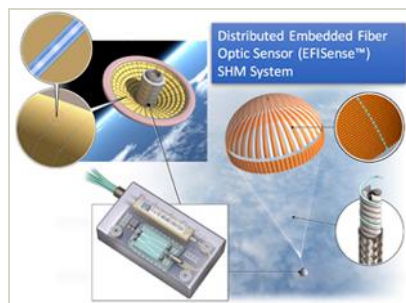
Final Summary Chart Image
Distributed Embedded Fiber Optic Sensor (EFISense) SHM System, Phase I Project Image
(https://techport.nasa.gov/image/128898)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Redondo Optics, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
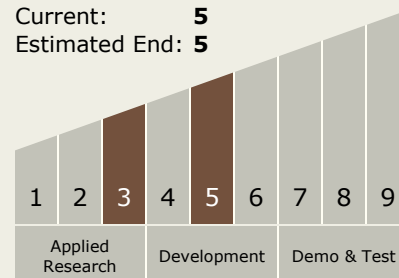Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Edgar A Mendoza

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  └ TX09.2 Descent
    └ TX09.2.1 Aerodynamic Decelerators

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System